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(54) Sound insulating double glazing

(57) A sound insulating double glazing unit comprises a laminated pane (2) and a monolithic pane (3) connected together and sealed at their edges in spaced apart relationship 10 to 20 mm apart. The laminated pane comprises two sheets (7, 8) of 3 mm glass adhering to an intermediate layer (9) of polyvinyl butyral 0.38 mm thick over the facing surfaces of the sheets, and the monolithic pane (3) is a pane of 6 mm glass or thicker glass.

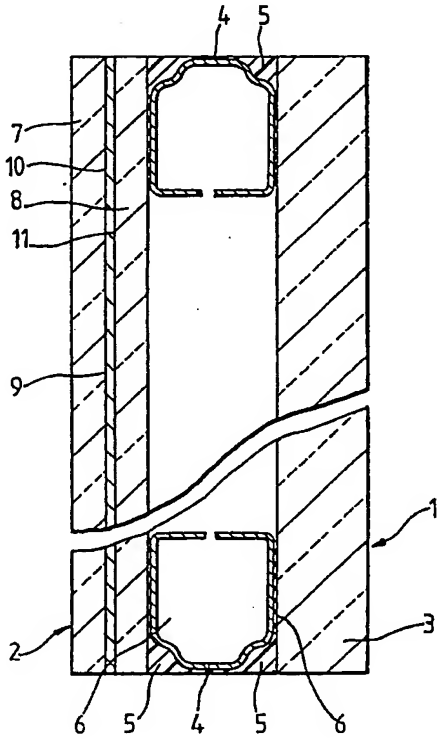

Fig.1.

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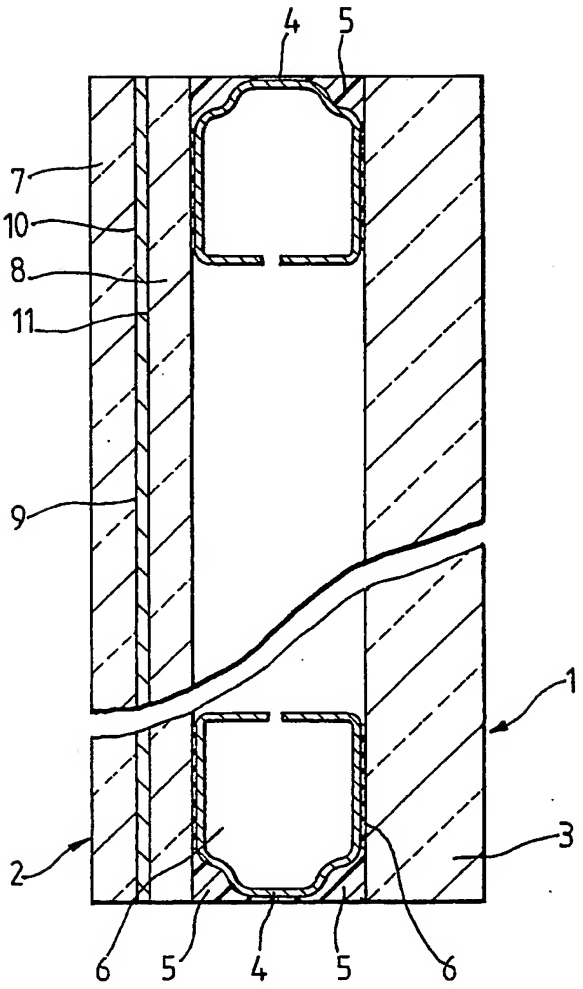

Fig.1.

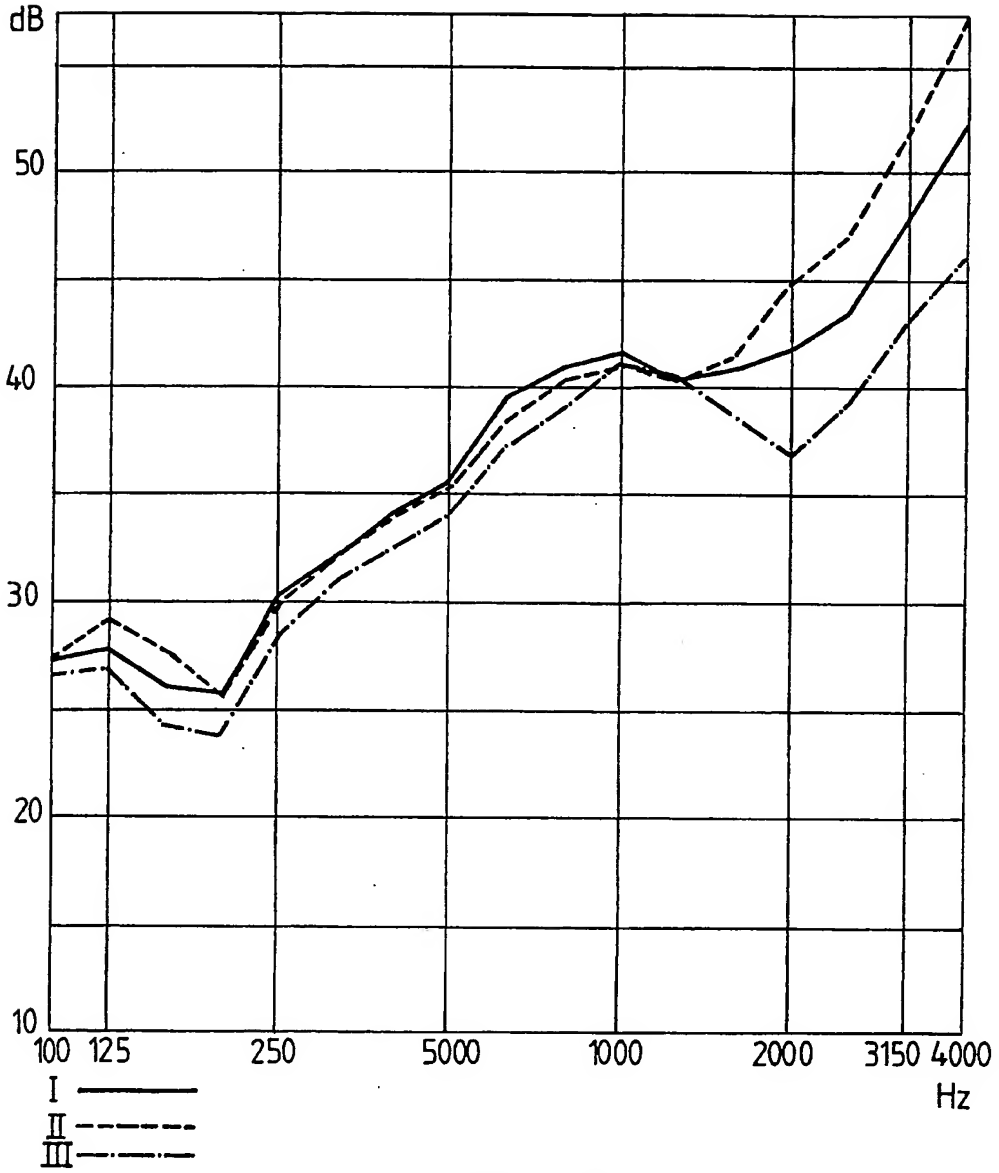

Fig. 2.

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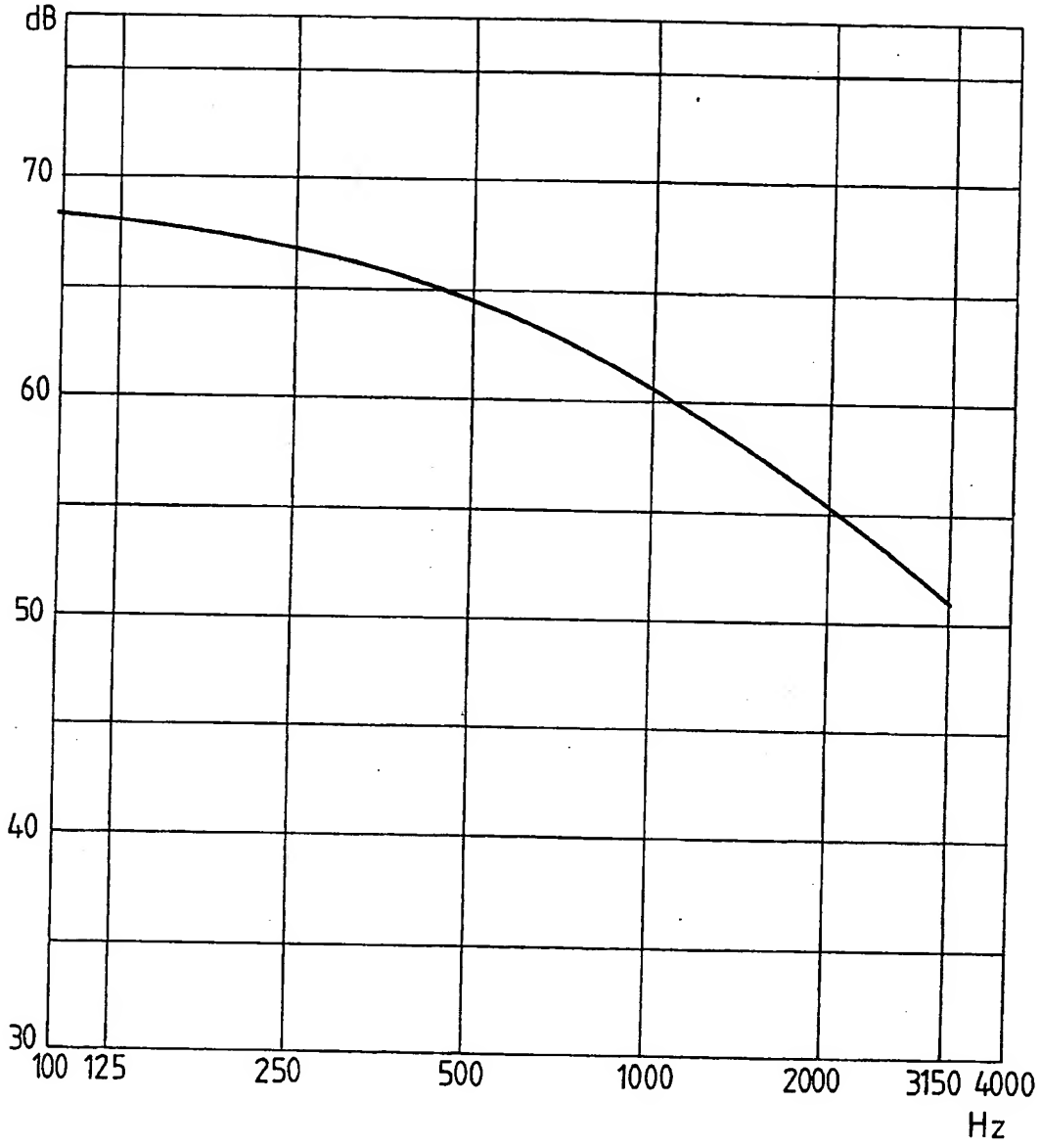

Fig.3.

SPECIFICATION

Sound insulating double glazing

The invention relates to windows with good acoustic insulating properties and, in particular, to a double glazing unit comprising a monolithic glass pane and a laminated pane.

Units of this general type are described in U.K. Patent 1,335,428. This patent describes sound insulating double glazing units comprising a laminated pane made up of two or more glass sheets inter-connected over their surfaces by an intermediate layer of visco-elastic material which is at least 0.76 mm thick, and a thick monolithic pane which is at least twice as thick as any of the individual glass sheets in the laminate, with a space between the panes of 10 to 20 mm. 'Visco-elastic material' is explained as meaning material exhibiting high internal damping, and the use of an intermediate layer comprising two or more polyvinyl butyral films each having a thickness of 0.38 mm to provide the required minimum thickness of 0.76 mm is preferred. The patent emphasises the importance of using a thick layer of visco-elastic material (said to be at least twice the thickness of 0.38 mm usually employed in producing architectural laminates for their safety properties) in order to benefit from the internal damping provided by the visco-elastic material and achieve the desired sound insulation.

Surprisingly, it has now been found that, when the laminated pane in the above described double glazing unit is made from two sheets of 3 mm glass with a polyvinyl butyral interlayer substantially as good sound insulation is obtaining using an interlayer 0.38 mm thick as an interlayer 0.76 mm thick. Thus substantially the same results can be achieved using the cheaper, more readily available 3 mm/0.38 mm/3 mm laminate in place of a 3 mm/0.76 mm/3 mm laminate.

According to the present invention there is provided a sound insulating double glazing unit comprising a laminated pane and a monolithic pane connected together and sealed at their edges in spaced apart relationship 10 to 20 mm apart, wherein the laminated pane comprise 2 sheets of 3 mm glass adhering to an intermediate layer of polyvinyl butyral 0.38 mm thick over the facing surfaces of the sheets, and the monolithic pane is a pane of 6 mm glass or thicker glass.

By "3 mm glass" we mean 3 mm glass as that term is generally understood in the trade i.e. nominally 3 mm thick, but in practice generally having a thickness in the range 2.8 to 3.2 mm. Similarly, by "6 mm glass" we mean 6 mm glass as that term is generally understood in the trade i.e. nominally 6 mm thick, but in practice generally having a thickness in the range 5.8 to 6.2 mm. In the same way, the expression "polyvinyl butyral 0.38 mm thick" is to be understood in the sense in which it is normally used in relation to laminated glass, that is, as having a nominal thickness of 0.38 mm but in practice generally having a thickness in the range 0.36 mm to 0.43 mm.

Preferably the monolithic pane is of 10 mm glass (i.e. nominal 10 mm glass having a thickness in the range 9.7 to 10.3 mm).

The invention is illustrated but not limited by the following description with reference to the accompanying drawings in which:

Figure 1 is a cross section (not to scale) through a preferred embodiment of the invention, illustrating the construction of the unit,

Figure 2 is a graph showing the sound insulation provided by a unit in accordance with the invention and certain other units for comparative purposes, and

Figure 3 is a graph of typical road traffic noise.

Referring to Figure 1, a double glazing unit 1 is made up of a laminated pane 2 and a monolithic glass pane 3. The panes 2 and 3 are spaced apart by an aluminium spacer 4 12 mm wide, and are connected and sealed together in conventional manner by a polysulphide sealant 5 adhering to the spacer and the panes. A butyl sealant 6 is also provided between the aluminium spacer and the adjoined glass surface as illustrated in Figure 1 to improve the seal, but this is not essential. The space between the panes is filled with dry air, although other gases or gas mixtures, e.g. as taught in U.K. patent specifications 1,511,921 and 1,511,922 may be used in place of air if desired.

The laminated pane 2 comprises 2 sheets of glass 7 and 8, each of nominal thickness 3 mm, adhering to an intermediate layer 9 of architectural grade polyvinyl butyral 0.38 mm thick, in this embodiment "Saflex" available in commerce from Monsanto Chemicals Ltd. of U.K., over the facing surfaces 10 and 11 of the sheets 7 and 8. The monolithic pane in the embodiment illustrated is of nominal thickness 10 mm.

The sound insulation in decibels (dB) of the unit illustrated was measured in accordance with British Standard 2750 : 1980 at frequencies in the range 100 to 3150 Hz and the results of attenuation plotted against frequency on the graph shown in Figure 2 to give the line marked I. For comparison purposes, the sound insulation of a similar unit, but with a 0.76 mm thick interlayer of the same architectural grade polyvinyl butyral was measured and also plotted in Figure 2 to give the line marked II. Finally a similar double glazing unit, but in which the laminated pane 2 was replaced by a monolithic glass pane of equal total glass thickness i.e. 6 mm, was constructed and its sound insulation properties measured to give the line marked III in Figure 2.

Referring to the lines I and III in Figure 2, it will be seen that the effect of using a laminated pane comprising 2 sheets of glass each 3 mm thick joined by a 0.38 mm intermediate layer of polyvinyl butyral in place of a monolithic pane of equal glass thickness is to significantly improve the sound insulation at all frequencies in

the range 100 to 3150 Hz except at a narrow range of frequency around 1250 Hz.

Referring to lines I and II in Figure 2, it will be seen that the effect of using a 0.38 mm intermediate layer of polyvinyl butyral in the laminate in place of a 0.76 mm layer is to actually improve the sound insulation performance over most of the range from 200 and 1250 Hz, with some loss of performance between 100 to 200 Hz and above 1250 Hz.

The results obtained were used to calculate the Rw values for the units tested. Rw is an internationally recognised index of sound insulation defined in British Standard 5821 : 1980.

The results obtained are shown below:

For the unit with 0.38 mm intermediate layer	Rw = 40 dB
For the unit with 0.76 mm intermediate layer	Rw = 40 dB
For the unit without interlayer	Rw = 38 dB

Rw is a measure of sound insulation over the frequency range 100 to 3150 Hz. Road traffic noise, on the other hand, is predominantly of low frequency and a typical road traffic noise spectrum at a level of 70 dBA is illustrated in Figure 3. Using this spectrum and the results of the sound insulation measurements referred to above and shown in Figure 2, the sound insulating effects of the units on such typical traffic noise were calculated and the following results obtained.

For the unit with 0.38 mm intermediate layer, traffic noise attenuation = 34 dBA
For the unit with 0.76 mm intermediate layer, traffic noise attenuation = 34 dBA
For the unit without intermediate layer, traffic noise attenuation = 32 dBA

It will be noted that the results are quoted in dBA i.e. after correction to take into account the response of the human ear at different frequencies (in accordance with publication 179 of the International Electrotechnical Commission of Geneva, Switzerland).

Thus, whilst the effect of replacing a monolithic pane with a laminated pane was to improve Rw and traffic noise attenuation by about 2 dB and 2 dBA respectively, the unit with the laminated pane with an intermediate layer 0.38 mm gave as good a performance, in both Rw and traffic noise attenuations as the unit with a laminate having an intermediate layer twice as thick, giving a considerable saving in the cost of the unit.

CLAIMS

1. According to the present invention there is provided a sound insulating double glazing unit comprising a laminated pane and a monolithic pane connected together and sealed at their edges in spaced apart relationship 10 to 20 mm apart, wherein the laminated pane comprise 2 sheets of 3 mm glass adhering to an intermediate layer of polyvinyl butyral 0.38 mm thick over the facing surfaces of the sheets, and the monolithic pane is a pane 6 mm glass or thicker glass.
2. A unit according to Claim 1 wherein the monolithic pane is of 10 mm glass.
3. A sound insulating double glazing unit substantially as hereinbefore described with reference to and as illustrated in Figure 1 of the accompanying drawings.

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